Phycoerythrin Concentration

Product Description

This product consists of three parameters which give the concentration of one of the major algal pigment groups in ocean water: Phycoerythrobilin Concentration (Parameter 3320), Phycourobilin Concentration (Parameter 5360), and Constituent Inherent Optical Properties (CDOM absorption, chlorophyllous absorption, and particulate backscatter, Parameter 5361). These quantities are provided at Level 2 at 1 km spatial resolution daily and at Level 3 daily and weekly at 1 km. The product is valid only for clear-sky ocean pixels.

Phycoerythrin is one of three major algal pigment groups found in marine phytoplankton and bacteria (Bidigare, 1990). The phycoerythrins are further subdivided into phycourobilin-rich (PUB) and phycoerythrobilin-rich (PEB) phycoerythrins. This algorithm retrieves both PUB and PEB rich cases. Phycoerythrin is a chlorophyll accessory pigment and serves to receive photosynthetically usable light in the 480 - 505 nm and 540 - 560 nm ranges. It is used to infer the global extent of phycoerythrin-bearing phytoplankton such as cyanobacteria which are nitrogen-fixing and thus provide information on the nitrogen cycle. Used in conjunction with phytoplankton chlorophyllous pigment, the apparent species diversity of the oceans can be inferred.

Research & Applications

One of the intended uses of the phycoerythrin data product is to allow scientific investigators to study the global distribution(s) of the phycoerythrin pigment, and in so doing allow definition of the diversity of phycoerythrin-bearing species such as cyanobacteria. When used in conjunction with chlorophyll distribution, phycoerythrin allows global phytoplankton species variability studies.

Data Set Evolution

The phycoerythrin retrieval algorithm requires water-leaving radiances which are generated from the incident solar irradiance, the total backscatter and the total absorption of sea water. The PUB and PEB parameters are retrieved by a sequential-convergent-iteration method (Gordon, 1988) which uses 5 independent bands. MODIS Band 10 (488 nm) and Band 12 (551 nm) correspond to the peaks of the PUB and PEB phycoerythrins. The major assumption for the algorithm is that the pigment specific absorption coefficient spectral model used is applicable for the oceanic province where the satellite image was acquired. The algorithm will be validated by ship and airborne laser-induced and water Raman normalized fluorescence measurements.

Suggested Reading

Bidigare, R.R., *et al.*, 1990.

Culver, M.E. and M.J. Perry, 1994.

Hoge, F.E. and R.N. Swift, 1986.

Hoge, F.E. and R.N. Swift, 1990.

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PRODUCT SUMMARY**

Coverage:
global ocean surface, clear-sky only

Spatial/Temporal Characteristics:
1 km/daily, weekly

Key Science Applications:
global phytoplankton species studies, ocean productivity models

Key Geophysical Parameters:
phycoerythrobilin-rich (PEB) and phycouroblin-rich (PUB) phycoerythrins

Processing Level:
2, 3

Product Type:
research, at-launch

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